CHAPTER 6
TRAINING

PART 1  Radiological Control Training and Qualification

611  Purpose

The provisions of this chapter ensure that individuals are trained to work safely in and around radiological hazards and to maintain their individual radiation exposure ALARA. Training conditions in this chapter apply to individuals entering controlled areas, handling or working with radioactive materials, or operating RGDs at Jefferson Lab, including DOE employees, subcontractors, service companies, other federal agencies, state and local governments and visitors.

612  Standardization

All individuals shall be trained in radiation safety prior to being permitted unescorted access to controlled areas and prior to receiving occupational dose. [§835.901(a)] The requirements for radiation safety training are outlined for two classes of individuals. Those who are permitted unescorted access to: (a) controlled areas; and (b) radiologically controlled areas, handle radioactive material, and work in radiological areas. These training programs are referred to as GERT and RW-I and -II, respectively.

Applicable portions of the DOE-sponsored core courses and training materials should be used as the basis for radiation safety training. In addition, site-specific training materials shall be used to instruct and qualify personnel for radiological work at Jefferson Lab. The RCM, or designee, shall review and approve site-generated radiological training materials.

To the extent appropriate to each individual’s prior training, work assignments, and degree of exposure to potential radiological hazards [§ 835.901(c)], radiation safety training shall include the following topics:
- risks of exposure to radiation and radioactive materials, including prenatal exposure
- basic radiological fundamentals and radiation protection concepts
- controls, limits, policies, procedures, alarms, and other measures implemented at the facility to control doses, including both routine and emergency actions
- individual rights and responsibilities as related to implementation of the facility RPP
- individual responsibilities for implementing ALARA measures as required by § 835.101
- individual exposure reports that may be requested per § 835.801

A certification letter or other documentation that identifies current Jefferson Lab training status will be provided upon request to assist in training reciprocity when traveling to other DOE facilities.
Additional training programs for visitors, radiation control workers, radiographers, etc. may be necessary to ensure compliance with §§ 835.901 and 835.103.

Successful completion of the entire core academic component of a DOE core course at another DOE site within the past two years may be recognized in lieu of Jefferson Lab radiation safety training provided that: (a) proof of training is provided in the form of a certification document containing the individual’s name, date of training, and specific topics covered; and (b) an appropriate official has certified the training of the individual.

Training reciprocity is contingent upon the completion of any Jefferson Lab site-specific training, a performance demonstration, and completion of a closed-book written or oral exam.

613 General Provisions

It is the responsibility of each individual and his or her supervisor to ensure that they have scheduled all appropriate radiation safety training prior to performing work that requires such.

Examinations and performance demonstrations shall be used to demonstrate satisfactory completion of initial RW-I and -II training [§835.901(b)], as well as to demonstrate satisfactory completion of theoretical and classroom material for qualification as an ARM or RCT. Examinations should be used for GERT and be written or computer-based; however, alternatives may be used to accommodate special needs. The exam process should ensure:

- a minimum passing score for each training program
- that true/false questions be avoided
- the use of questions randomly selected from a question bank
- acknowledgment, by signature, that the student participated in a post-examination review
- remedial actions for failure to meet the minimum score
- that questions test what the student is expected to remember months after the training rather than to test short term memory of theoretical material

The performance demonstration process should include/ensure:

- identification of specific performance elements that are related to the training objectives
- a minimum passing score for each training program and, where appropriate, identification of specific performance elements that must be satisfactorily demonstrated
- an opportunity for the trainee to ask questions, practice, or otherwise prepare for the performance demonstration
- that the trainee is not coached by the instructor during the performance demonstration
- a simulation or mock-up of a radiological area(s) adequate to allow demonstration of the required performance elements in a safe and controlled environment
- remedial actions for failure to meet the minimum score

Retraining shall be provided when there are significant changes to radiation protection policies and procedures, and shall be conducted at intervals not to exceed 24 months. Completion of an examination is required whenever retraining is necessary.
Changes to a training program shall be incorporated as they are identified and a decision made if retraining is required prior to the 24-month period. Training shall include both normal and abnormal radiological situations, changes in requirements, and should include updates of relevant lessons learned from operations and maintenance experience, and occurrence reporting for site and other DOE facilities, as applicable.

Verification of the effectiveness of radiation safety training should be accomplished by surveying a limited subset of former students in the workplace.

Reading and comprehension skills in the English language are generally necessary for radiation safety training. If the instructor is unable to verify that the student can comply with written and/or oral instructions in English, the instructor shall not qualify the student. In some cases, visitor orientation and the use of a trained escort may provide a temporary alternative to radiation safety training.

When an escort is used in lieu of training, the escort shall: (a) have completed the radiation safety training required for entry to the area and performance of work therein; and (b) ensure that all escorted individuals comply with the documented RPP. [§ 835.901(d)]

Training records and course documentation shall meet the requirements of Article 724.

614 Instructor Training and Qualification

Instructors should have the technical knowledge, experience, and instructional skills required to fulfill their assigned duties. (The decision for the suitability of a staff member to serve as an instructor lies with the RCM.) Instructors-in-training shall be monitored by a qualified instructor. Subject matter experts without instructor qualification may provide training in their areas of expertise.

PART 2 General Employee Radiological Training

621 Site Personnel

All personnel at Jefferson Lab shall complete GERT prior to unescorted access to controlled areas. Because individuals may encounter RCAs with radiological barriers, postings, or RAM, training should include specific instructions and precautions for working around these materials, such as limitations on moving and/or handling them.

General employee radiological training should include DOE’s core course training materials and additional site-specific information, as appropriate. Additional training beyond GERT is required for unescorted entry into radiologically controlled or radiological areas. [§ 835.901(b) (1)] Classroom lecture, web-based courses, or other appropriate methods may be used to communicate appropriate information.
Requirements for qualification, testing, and requalification in GERT are contained in Article 613.

622 Radiological Safety Orientation for Visitors, Tour Groups and Other Untrained Individuals

Visitors who enter a controlled area must be escorted by an individual who is qualified with GERT or higher training while visitors who enter an RCA must be escorted by an individual who is qualified with RW-I or higher. In addition, such visitors should receive radiation safety orientation that includes the following topics:

- risk of low-level occupational radiation exposure, including cancer and genetic effects
- risk of prenatal radiation exposure
- responsibilities for radiation safety
- adherence to radiological posting and labeling
- applicable emergency procedures
- training for issuance of dosimeters (where applicable)

Information may be communicated by classroom lecture, web-based courses, or other appropriate methods - an examination, however, is not required.

PART 3 Radiation Worker Training

631 General Provisions

The knowledge of radiation safety possessed by radiological workers shall be verified by examination and performance demonstration prior to an unsupervised assignment, the level of which shall be commensurate with each worker’s assignment. [§ 835.901(b)]

Radiation Worker I training shall be completed prior to unescorted entry into an RCA or performing unescorted assignments as a radiological worker. Furthermore, RW-II training shall be completed prior to entry into contamination, high contamination, or airborne radioactivity areas (when posting is based on particulate airborne radioactivity), and before handling material known or likely to exceed the contamination limits in Appendix 2B of this Manual.

Radiation Worker I training is a prerequisite for RW-II training which expands on the topic of hands-on work with radioactive contamination. Additional training may be required for special job functions having radiological consequences.

If an escort is used in lieu of training, the escort shall have completed the level of training required for the areas to be entered and the work to be performed, and shall ensure that the escorted individual complies with the RPP. [§ 835.901(d)]
632 Radiation Worker I

Radiation Worker I training shall consist of applicable portions of the DOE core course and emphasize site-specific information. This training shall encompass, at a minimum, the following performance demonstration elements:

- entering and exiting simulated controlled areas, radiation areas, and high radiation areas
- reading and interpreting applicable personnel dosimetry devices and instrumentation and taking appropriate actions based on the readings
- use of RWPs
- anticipated response to abnormal situations

The RCM may authorize special or non-standardized radiological worker training for individuals with unusual or limited radiological duties or responsibilities. This training shall meet all applicable requirements in 10 CFR 835 and shall be documented.

Personnel who maintain qualifications as RW-I satisfy the requirements of GERT.

633 Radiation Worker II

Radiological Worker II training shall consist of applicable portions of the DOE core course and emphasize site-specific information. At a minimum, the following performance demonstration elements shall be encompassed in the training:

- donning of PC, as applicable
- entering a simulated contamination area
- removing PC and equipment and subsequently exiting the simulated area
- verification of instrument response and source check
- performance of monitoring (frisking) for personnel contamination

Note: Respiratory protection training is not covered in RW-II training (see Part 3 of Chapter 5).

634 Specialized Training

Specialized training should be completed for non-routine operations or work in areas with changing radiological conditions. This training is in addition to RW-I or -II training and should be provided to personnel planning, preparing, and performing jobs that have the potential for significant radiological consequences. Such jobs may involve special containment devices, the use of mockups, and ALARA considerations. Pre-job briefings are a form of such specialized training.

Other training provided in the workplace, including mock-up training for specific jobs, trade- or craft-specific training, laboratory safety training, and pre-job briefings, may include specific instructions regarding radiological controls. Documentation of these types of training is not required to satisfy the requirements of § 835.902.
PART 4 Radiological Control Technician Training

641 General Provisions

The requirements for RCT training, including eligibility, qualification and continuing training, are found in the Jefferson Lab Radiological Control Technician Training Program Management Manual (RCD-PMAN-98 #001). The requirements are based on applicable standards, including DOE-suggested training materials, and are supplemented with Lab-specific elements.

Radiological Control Technician training includes on-the-job training (OJT) to provide hands-on experience directly applicable to the job and is specified in individual training plans (ITPs) for each technician.

Trainees should be under the control of qualified personnel. Before performing a job function without direct supervision, a trainee with partially completed qualifications shall have completed the qualification for that task.

Retraining programs for RCTs shall be established and conducted at intervals not to exceed two years and should include:
- selected job-specific tasks identified through job analysis
- selected fundamental and/or site academic topics
- training on new equipment or procedures, as necessary, to familiarize RCTs with the tasks
- training on industry events/occurrences or developments in new methods and technologies or regulations and guidance
- selected topics in accelerator systems and components
- other topics, as necessary, based on needs or regulatory requirements

642 Eligibility and Training

Radiological control technician candidates who have prerequisite knowledge, such as college credit, operational experience, or related qualifications, may satisfy individual sections of the standardized core course training requirements by passing comprehensive challenge examinations. In addition, allowance may be made for previous training on generic radiation safety topics (i.e., those not specific to a site or facility), provided that documentation of the previous training is obtained.

Entry-level prerequisites shall be established to ensure that RCTs meet the standards for physical condition and education. These standards should include, at a minimum, the following:
- high school education or equivalency
- fundamentals of mathematics, physics, chemistry and science
- systems and fundamentals of process, operations and maintenance
- a reading and comprehension level sufficient to follow procedures, write permits, prepare survey maps, write reports, and prepare shipping and transfer permits
- the ability to work in a support role, including communicating verbal instructions to others
- physical requirements to handle personal protective and other equipment, and assist others in work locations, commensurate with assignment

Radiological control technicians are encouraged to pursue registration by the NRRPT. This shall be considered equivalent to completion of the core training requirements.

The RCT training program shall include procedures specific to the site or facility where the technician is assigned and shall be commensurate with the technician’s assignment. Training for RCTs shall either precede performance of tasks assigned or be concurrent with such assignments if the individual is accompanied by and under the direct supervision of a fully trained individual.

The required level of knowledge of radiation safety possessed by RCTs shall be verified by examination, to include demonstration, prior to any unsupervised work assignment.

**643 Continuing Training**

Following initial qualification, the RCT should begin a two-year cycle of continuing training required for requalification which shall include written examinations and may include performance demonstrations.

Continuing training should provide continued improvement in the knowledge and skills of the RCT. Training should include site-specific and DOE-wide changes in requirements; changes in procedures; updates of lessons learned from operating experience and industry events; familiarization with new equipment; and, other topics identified through job and task analysis or radiological performance (both positive and negative) in the field. Continued training should also include written examinations as applicable, demonstrations of proficiency controlled by qualification standards, and oral examinations as needed to ensure understanding of the topic. Infrequently performed tasks, such as those for emergency response, may require annual training – other tasks may require training prior to initiation.

Personnel who maintain qualification as RCTs satisfy the requirements of RW-I and -II & ARM training.

**644 Supervisors**

Radiological control technician supervisors shall maintain training in tasks they supervise or perform. They should have supervisory and leadership capabilities to direct the work of technicians; effectively interact with line supervisors, professional staff, and other managers; and, be able to respond and direct others in an emergency and abnormal situations. [§ 835.103]
PART 5 Other Radiological Training

651 Radiological Control Personnel

Radiological control technical staff and management shall have:
- a combination of education and experience commensurate with their job responsibilities [
  § 835.103]
- continuing training based on an assessment of job responsibilities to maintain and enhance proficiency
- continuing training to remain cognizant of changes to the facility, operating experience, procedures, regulations and quality assurance requirements

Radiological support personnel shall have:
- Radiation Worker I, -II, ARM or RCT training, and additional job-specific topics, as applicable
- training appropriate to the tasks to be performed
- continuing training to provide continued improvement in knowledge and skills

Certification and involvement with professional industry organizations is encouraged.

652 Assigned Radiation Monitors

Assigned radiation monitors are Lab employees whose primary work assignment is outside of the RCD, but who have specific training provided by the RCD on the proper conduct and documentation of radiation surveys. [§ 835.103]

The requirements for ARM training are found in the Jefferson Lab Radiological Safety Training Program Management Manual (RCD-PMAN-11 #001). Assigned radiation monitor training includes an initial training class, written examinations, OJT evaluated through job performance measures (JPMs) and a practical demonstration. (Retraining shall include written examinations.)

There are four types of ARM qualification based on the areas in which an individual may perform surveys. They are:
- comprehensive (includes CEBAF beam enclosure and LERF areas)
- experimental halls only
- LERF-only
- Vertical Test Area (VTA)-only

All ARM qualifications, except for VTA-only, satisfy the RW-I training and GERT.

Trainees should be under the control of qualified personnel. Before performing a job function without direct supervision, a trainee with partially completed qualifications shall have completed the qualification for that particular task.
Radiographers and Radiation-generating Device Operators

Radiographers performing work at Jefferson Lab are considered to be radiological workers. The RCD has evaluated training requirements of radiographers and radiographers’ assistants, as defined in 10 CFR 34, and has established the following requirements:

- Training required by 10 CFR 34 satisfies the training requirements of radiological workers in 10 CFR 835 for the conduct of radiographic operations at Jefferson Lab.
- Radiographers needing unescorted access to controlled areas shall have GERT and shall meet other applicable training requirements for unescorted access to the accelerator site.
- Radiographers needing unescorted access to RCAs shall have RW-I training, unless excepted in writing by the RCM.

Radiographers shall also follow the provisions of this Manual and any specific instruction given to them by RCD personnel. Radiological work permits shall be used to authorize radiographic operations.

Other activities utilizing sealed sources for non-destructive testing (i.e., soil density gauges) shall be conducted as directed by the RCD. Training requirements for such operations shall be determined and documented as applicable to the type of operation. Written work authorizations shall be used, as appropriate, to control such work.

Emergency Response Personnel

Nothing in this Manual shall be construed as limiting actions that may be necessary to protect health and safety. Provisions shall be in place to accommodate rapid site and radiological area access by on site and offsite emergency workers such as firefighters, medical and security personnel. These provisions should include training, escorts and dosimetry as appropriate for the situation. The training should be special radiological worker training commensurate with the situations likely to be encountered, and should emphasize that saving lives has priority over radiological controls.